A photograph of a forest fire. In the foreground, a large fire burns on the forest floor, with thick smoke rising. In the background, several firefighters in yellow gear are visible, working to contain the fire. The trees are mostly bare, suggesting autumn or winter. The overall scene is dramatic and captures the intensity of a controlled burn.


FIERY FRIEND OF THE FOREST

BY CORNELIA F. MUTEL PHOTOS BY CORNELIA F. MUTEL AND BEN HILL

Long suppressed, with
adverse effects, fire is back.

My husband and I moved to Iowa from the Colorado Rockies in 1975. We brought along memories of the mountain cabin we'd called home, a small log structure surrounded by towering ponderosa pines that ceded to flower-speckled meadows. So it wasn't surprising that once in Iowa, we soon were searching for a wooded lot where we could again immerse ourselves in nature. We found it in a 16-acre woodlot in the rolling hills near the Coralville Reservoir, within easy commuting distance of our Iowa City jobs. We were thrilled to think that we were only the third owners of this land. Originally used as a settler's woodlot providing the farmer with fuel, fenceposts and lumber, it had been deeded to a farm helper in payment for her services. We bought it from that helper's elderly daughter. Other than performing a single partial logging in the 1930s, she and her mother had let the land sit. We felt privileged to find a chunk of Iowa that had escaped plowing, intensive logging and heavy grazing. Our land was cheap as well

PHOTO, THIS SPREAD, BY BEN HILL



LIGHTING A BACK FIRE: these slow-moving fires burn into the wind and are used to create wide fire breaks to prevent the fire from entering unintended areas. The burn crew constantly monitors fire speed and direction. During the early phase of a controlled burn, additional information is learned about the fire behavior and fuel on the forest floor.



Crew from Transition Ecology, the Iowa City company hired to conduct the burn, assess fire breaks around the perimeter and ensure their ATV has complete access. **CENTER:** Raking brush away from small oak trees protects them from the fire. Larger oaks are largely fire-resistant to low-intensity fires, having evolved to become dependent on fire to create open, sunlit conditions required for successful growth. A leaf blower is used to cast aside leaves and other lightweight fuels to reinforce fire breaks. **RIGHT:** The burn crew ignites the back fire, a small, well-controlled fire used to create a wide fire break to protect property and structures. Successful prescribed burns are highly planned, and done by staff with wildland fire training.

as beautiful and, most importantly for us, full of wildlife and native wildflowers.

I am a botanist by training. But I'm embarrassed to think back on how little I understood our land those first years. I could see it was dominated by mature, huge red and white oaks with a scattering of equally large shagbark hickories. I could see younger trees of many species were filling in between the oaks, with ironwood coming in en masse, forming patches of pole timber that made passage difficult. And I could see that sugar maples were slowly establishing themselves, with a few mature and many more young maple trees in our woods. But young oaks were absent. I assumed all this was "natural" and thus good. I didn't take these ongoing changes to their obvious conclusions, or realize that our woods, like others across the Midwest, were subject to patterns and processes that were steadily wiping out our oaks.

Shortly after Euroamerican settlement in the mid-1800s, oaks had been Iowa's most ubiquitous and abundant trees, with two-thirds or more of all trees in many counties being oaks. They had been the standard bearer for the Midwest—indeed, for much of the eastern U.S. Their acorns, along with nuts from associated hickories, had fed much more wildlife than any other tree species. Many mammals and birds had depended on the protein and fat from these nuts to keep them alive through long snowy winters. Moreover, open oak woodlands provided a sun-dappled forest floor that

fostered a highly diverse understory and also provided homes for abundant insects, reptiles and amphibians. Thus oaks are dubbed "keystone species," or plants responsible for the survival of numerous other species.

Today we can barely imagine how these woodlands must have appeared and sounded a few hundred years ago, with their wandering elk and occasional lumbering black bear, gray fox and other smaller mammals peering down from trees, myriad insects and great numbers of diverse, colorful nesting birds, including huge clouds of passenger pigeons—now extinct, but once the most abundant land bird in North America—flowing like rivers through the sky, landing in the oaks to nest and feed on acorns. And because we can't know what these woods were once like, we will never know all that we have lost.

Iowa's presettlement oak woodlands lay mostly in eastern and south-central Iowa. They ranged from very open savannas (with a small number of oaks per acre) to much denser forests of oaks, with a full range of intermediate densities. However, for the most part, historic oak woodlands were airy, two-layered communities that were much more open than they are today. How do we know this? In part from historical data and descriptions, for example early explorers' journals, and in part because of the behavior of oaks: they need light to reproduce. Shade a young oak, and its growth is stunted or it dies. This is especially true of the most light-demanding species that were also the most

abundant oaks in Iowa, bur and white oak. Allow shade into a mature oak woodland and its character will change dramatically, the oaks ceding to trees that flourish in dark conditions.

Rethinking Smokey Bear

Within a few years of buying our land, we had built a home and started a family. Soon our boys were bobbing through the woods in search of adventure. Our family delighted in the woods. The boys learned the names of birds at the feeder and those of spring wildflowers, the bloodroot and rue anemone, jack-in-the-pulpit and Jacob's ladder. They found treasures on their expeditions: a tree cavity with baby raccoons peeking out, a young opossum crawling through the litter, a luna moth exiting its chrysalis. Our family became accustomed to the disturbing nighttime "scream" of barred owls and the occasional glut of ticks and mosquitoes. We laughed when a walking stick crossed the path in front of us, or a gray treefrog hunted insects on the window screen, revealing its bright orange thighs. All are a part of the bigger whole, I taught my boys. We are guests in this amazingly complex assemblage of woodland life. We should be observers, not actors. The woods can take care of itself.

Nature caring for itself—that was the

mantra back then. And so for many years I did nothing to our woods, other than eliminating problematic exotic invasive plants: aggressive species that are not native to Iowa such as bush honeysuckle and the occasional multiflora rose, barberry and European buckthorn. When garlic mustard first appeared in the neighborhood, I started monitoring our woods with a vengeance. But other than that, I held back. Leave nature alone and it will be fine. That's what I thought back then. That's what we all thought.

Well, nearly all of us. But in 1990, the Iowa DNR started to burn woodlands. Minnesota, Missouri and Wisconsin had been doing this for years already, and burns were by then a routine element of prairie management. But burn a forest? Some people viewed this as crazy. We'd been raised on the Smokey Bear philosophy: fires were a disaster that killed trees and woodland creatures. They were something to be fought, not perpetuated. We didn't realize that the majority of Earth's ecosystems had evolved with fire set either by lightning or by early humans. In Midwestern woodlands, Native Americans had set fires to open the woodlands and ease travel, increase visibility, control pests and aid in the gathering of acorns and nuts.

With time, oak woodlands and other regularly fired landscapes not only had become fire-tolerant,



From a safe location, volunteers and guests of the landowner assist lighting the fire under the eye of the burn chief.

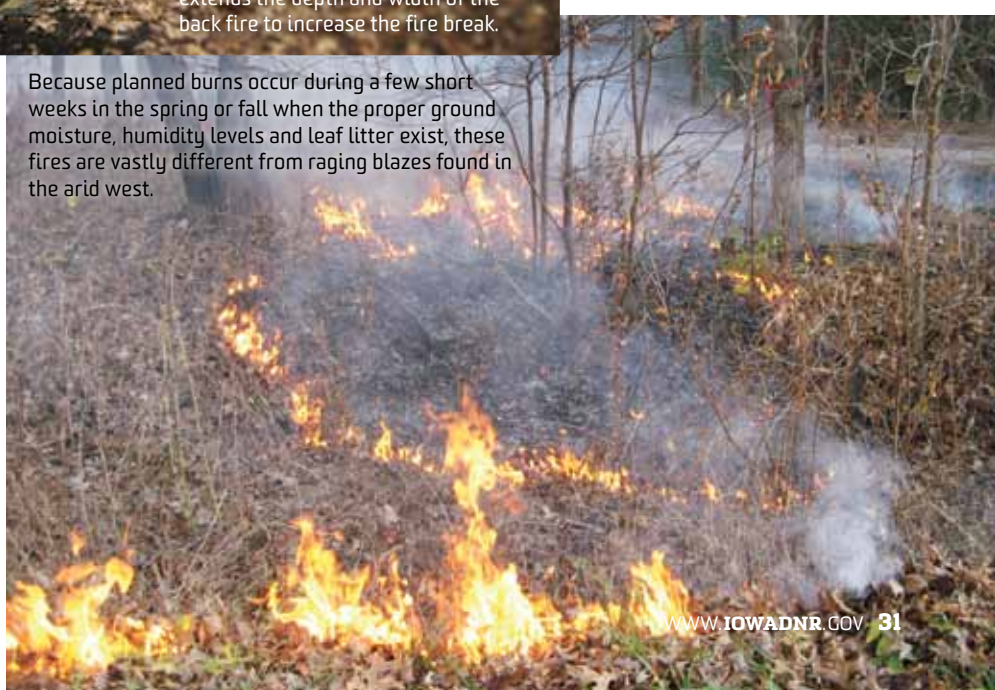


The fire crew from Transition Ecology extends the depth and width of the back fire to increase the fire break.



Writer Connie Mutel and burn boss Liz Maas brief before the fire.

Because planned burns occur during a few short weeks in the spring or fall when the proper ground moisture, humidity levels and leaf litter exist, these fires are vastly different from raging blazes found in the arid west.





Prior to Iowa statehood, low-intensity, vegetation-renewing fires occurred over large areas of forests every few years, often set by native peoples or lightning. Oak species adapted to fire, their thick bark withstanding the heat and flames. Fire removed layers of dead leaves and woody shrubs, allowing early spring wildflowers to grow and keeping less fire tolerant trees such as maple and basswood from taking hold. For the last 160 years, fire was suppressed—its role misunderstood. As a result, oak forests are in decline, their seedlings choked out by faster growing, shade tolerant trees and shrubs. Prescribed fire can help restore the natural balance and allow oaks to reestablish their dominance.

they had become fire-dependent. In Iowa, woodland fires were neither as frequent nor as hot as prairie wildfires, but they were crucial for creating open, light-filled communities where oaks could reproduce successfully. Mature oaks are shielded from fire's heat by their thick bark. Fire might burn back young oak shoots, but root masses survive to sprout robust new shoots. Give young oaks sufficient light and several years without fire, and the trees grow large enough to repopulate the woodland. Fire also fostered the growth of a diversity of understory grasses, sedges and flowering plants that bloomed throughout the summer, plants that loved the dappled light of open woodlands. Fire was supplemented by animal actions such as the browsing, stamping and rubbing of elk, which were once widespread in Iowa. The result: Iowa's easily traversed oak woodlands, which settlers claimed could be crossed anywhere by a horse-drawn wagon or by a rider on a galloping horse.

Then, starting in the 1830s, settlers started to pour into Iowa, bringing with them a fear of fire. This was not surprising: fire could in a few minutes destroy all that a farmer had struggled to establish—home, barn and outbuildings, crops, livestock. Broad swaths of plowed prairies provided sites to plant crops even as they protected human structures from the forces of destruction. New settlers wiped fire from the landscape as quickly and as thoroughly as possible.

The Slow, Silent Death of Iowa's Oaklands

But suppressing fire produced unexpected consequences. For thousands of years, fire restricted the great majority of Iowa's trees and shrubs to the moister valleys and floodplains that didn't burn as often as uplands. There, these thin-barked species, which were easily killed by fire, formed dense multi-layered forests that differed dramatically from the airy upland oak-dominated woods. Now, with fire gone, the lowland species began to creep up the hillsides. Massive slow-growing upland oaks and shagbark hickories were joined by young, more-shade-tolerant elms, hackberry, ironwood, basswood, sugar maple, bitternut hickory, black cherry and others. These shade-tolerant species started to transform the previously open sunny oak woodlands into dark, closed forests. As these other trees increased, the oaks disappeared. They could not successfully reproduce in the shade, nor could young oaks survive; indeed some of the invading shade-tolerant trees overtopped and killed even mature oaks. Other savanna-loving plants and animals started to disappear.

Today, researchers are finding that oaks are declining dramatically across the eastern U.S., ceding to dense, shade-tolerant maple-basswood forests or other plant communities. In the eastern U.S., almost no white oak reproduction has been successful for the past century. U.S. Forest Service inventories show that from 1954 to 2000, oak-dominated woodlands dropped from 50 percent to 37 percent of all Iowa uplands, while maple-



basswood timberland increased from 3 percent to 34 percent. Without focused restoration efforts, Iowa's oak woodlands may disappear by 2060. As the "keystone" oaks go, many other species are bound to disappear with them. The combination of losses would produce dramatic shifts in the structure and integrity of Iowa's remaining woodlands, leaving a landscape with significantly less biological diversity and stability.

This sea change was already underway when my husband and I moved into our woods. By the 1990s, it was too obvious to ignore. I grew to dread the suffocatingly dark wall of leaves just outside our windows. One summer, looking out at an oppressive thicket of young ironwoods and hackberries, I asked my teenaged sons to take their bow-saws and hatchets out into the woods and clear the young trees. They quickly made a garage-sized pile as tall as they were.

A few years later, as more Iowans were beginning to burn their oaklands, I proposed to my sons that we give it a try. As boys who had been raised burning nearby prairie plantings, they responded with enthusiasm: a fire right outside their door? Sure! We started to burn small patches on calm fall days. At first I feared that these fires would explode into infernos. But soon I realized that woodland fires are far different than racing prairie fires. If performed with careful attention to weather conditions and possible dangers such as standing dead trees, woodland fires typically rise inches rather than feet. I would clear a break

around a small plot and then spend the afternoon watching the flames creep through the oak leaves. These slow burns sometimes brought unexpected delights, such as the few dozen migrating bluebirds that once swooped down and stayed with me for two hours. They perched in the trees and jumped into the ashes of just-burned leaves, eating exposed insects on the freshly bared soil. Eastern bluebirds are savanna species; somewhere in their genetic memory, they remembered that fire and smoke meant food.

My boys and I continued our limited, small-scale thinning and burning efforts, but before long my sons were grown and gone. I wasn't comfortable burning alone. My unease was heightened by my husband, who continued to see prescribed fire as an aberration rather than an aid. I would joke that I would set fires, and he'd follow along and put them out. Sometimes this was literally true.

But I was also starting to see amazing changes in the burned, open sections of our woods. Responding to increased sunlight, woodland grasses—bottlebrush, Virginia wild rye, wood reed—increased in number. Patches of sedges grew in height, produced more seeds, and extended outward. Our woodland flowers increased similarly, with summer- and fall-blooming species—Joe Pye weed, American bellflower, woodland sunflower, ground nut and horse gentian—blooming after the spring wildflowers had withered. In autumn, ever larger expanses were covered with the golden spikes of



Smoke management plans are key. Here, wind carries smoke away from the road.



The fire crew from Transition Ecology after a hard day's work.



The burn crew discusses the burn plan and preps gear before lighting the fire.

TOP LEFT and CENTER: The day after the fire, the woods is blackened, but by early next spring, lush green sedges proliferate. The presence of sedges indicates good restoration potential in woodlands.

BOTTOM LEFT: By late spring, the oakland is awash with lavender blossoms of wild geranium. Note the sharp line that marks the unburned shrubby area on the left, and the open, sunlit areas covered with flowers on the right. As testament to nature's post-burn handiwork, these flowering species were not planted by people, but just laying in wait for fire to open up the forest floor to reemerge.

elm-leaved goldenrod. My first identification of Poke's milkweed was a particular thrill. It had been identified as rare in Johnson County back in the 1950s. Yet here it was, blossoming and spreading in the burned patches. I also noted oak seedlings that were growing to knee height. I caged the best of these to protect them from the deer.

Enlisting Fire's Kiss of Renewal

To extend these positive changes beyond my small tended patches, I was going to need help. Finally, in 2010, I started to act. I contacted my DNR district forester, who walked our woods and drew up a management plan with woodland restoration in mind. I hired someone to cut or girdle specified ironwood, hackberry, bitternut hickory, basswood, elm and green ash. The girdled trees, with two encircling cuts through their bark and underlying conductive tissues, would die but remain standing for wildlife habitat. And I contracted a trained and experienced burn crew to conduct a prescribed burn of five acres of our most promising woods—a chunk dominated by white oaks, with plenty of sedges and diverse flowering plants on the ground. Then we waited for the right weather.

The burn crew arrived on a breezy November Saturday, when crunchy oak leaves invited incineration. After walking the woods one last time, the crew started with a cautious and slow “back fire” (burning into the wind) that formed a very wide fire break. Then the burn boss said “Let it rip!” and the crew used their drip torches to form a “ring fire” around the designated 5 acres, and also lit parallel lines of “flank fires” within the woods. Lines of red and orange and yellow flames hugged the ground, crisscrossing the woods.

At some point, the fire took on a life of its own. Lines of back fires and “head fires” burning with the wind collided and whooshed upward, the pulses of white and gray smoke crashing, mingling and forming whirlwinds and curlicues, lunging forward and then ebbing back, performing an unchoreographed dance of pure energy, all under an azure sky. Everyone involved watched in awe. I felt that I was privy to the inner workings of Earth's elementary power, like I was standing in a tidal wave or volcanic eruption. I realized I was watching the point at which the forces of creation and destruction become inseparable.

Soon the flames died and the smoke settled enough so I could peer into the woods once again. The rivulets of orange flame were now reduced to short lines eating up scattered remnants of leaf-litter fuel. Then those too died, and only a few stumps and downed logs emitted sparks or smoke. Crew members wandered through the woods with their backpack sprayers, squirting these with water. By the time they were done, dusk had fallen, and we all went inside to share lasagna that I'd prepared the night before and revel in our profound sense of accomplishment.

We agreed that the burn had been an unmitigated

success. The fire had been a way of returning natural processes to the land, so that our woods could once again write its own operating instructions. But one of the day's most amazing results was my husband's response. He'd agreed to stay and watch the fire with reluctance, fearing destruction and chaos. But even while the burn crew was first preparing equipment, I could sense his tension melting into relaxed observation. “They really know what they're doing, don't they?” he commented, viewing the well-equipped Nomex-clad crew of nine checking in with each other on their walkie-talkies, confirming the weather and predicted wind speeds, and circling the land with their water tanks. “I can't believe how organized they are, how well they are doing this,” my husband added as we marveled at the power and beauty of the event.

My husband has started bragging to others about our woodland burn. He's told me that he's looking forward to seeing what flowers we'll see this coming spring. Others have wondered the same thing. I just smile in response. Our woods lay without fire for more than 150 years. Healing changes may come slowly; a single burn is just the beginning. But I believe that with time, the native understory plants will increase in vigor and diversity, the soils will become richer in organic matter and their water absorption capabilities will rise, and I'll see more small oak trees grow and join the ranks of their progenitors. I trust that native insects and fungi will thrive here in increasing numbers. I'll do what is needed to help them out: I plan to burn annually, at least for the next few years. I'll monitor for exotic invasive plants and take steps to control proliferation of native increasers such as raspberry brambles. Then I'll wait for each passage of the seasons to bring surprises and let nature (with a little help from me) really “do its own thing,” but on its own terms, not ours. In my estimation, our oak woodlands deserve nothing less.

FIRE SAFETY

Fire is a good forest management tool, but it can be dangerous. Poorly planned or managed fires or fires set under the wrong conditions can threaten personal property and safety, and can damage individual trees and woodland health. Fire goals and a burn plan should be developed in advance, and fires should be executed by trained personnel. Burn only under the right situation and conditions. Notify the local fire department, local sheriff and neighbors before the fire is set.

Many Iowa oak woodlands have high restoration potential. But not all will respond well to restoration or prescribed fire. For evaluation help, contact your DNR district forester or a private restoration consultant.

For more information on oak woodlands and Iowa's other native ecosystems, their changes in the last 200 years, and what we can do to restore them, see the author's book *The Emerald Horizon: A History of Nature in Iowa* (University of Iowa Press 2008). 📖